DESIGN AND FABRICATE A SYSTEMATIC DISH RACK DRAINER

MOHD HAFIZ B MOHD NOR

Report submitted in partial fulfilment of the requirements
for the award of Diploma in Mechanical Engineering

Faculty of Mechanical Engineering
UNIVERSITI MALAYSIA PAHANG

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SUPERVISOR'S DECLARATION

I hereby declare that I have checked this report and in my opinion this project is satisfactory in term of scope and quality for the award of Diploma in Mechanical Engineering.

Signature : ……

Name of Supervisor : EN MOHD SAZALI B SALLEH

Position :VOCATIONAL TRAINING OFFICER

Date : ……..

STUDENT'S DECLARATION

I hereby declare the work in this report is my own except for quotations and summaries which have been duty acknowledged. The report has not been accepted for any diploma and not concurrently submitted for award of other diploma.

SIGNATURE: ……..
NAME : MOHD HAFIZ B MOHD NOR
ID NUMBER : MB06046
DATE : 7 NOVEMBER 2008

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I would to thanks to all the staff in mechanical laboratory for their precious comments, sharing idea and knowledge during this project being carried out. I also want acknowledge the assistance of everybody especially students from Diploma of Mechanical Engineering for spending their time in helping me sharing and solve the problem during my hard time in fabricated the project and finishing the report for this final year project. Finally, my profound thanks and gratitude for my family for their continuous support and confidence in my efforts.

ABSTRACT

The idea to create and build a systematic dish rack drainer is come from supervisor that gives me this title and task for this project. To design and fabricated this cabinet, it must be compare with other product that maybe available in the market. First, get an idea from internet, magazine, newspaper or other from available data. Form there the information and idea to design and fabricated can be created.

Whole project involves various methods such as collecting data, concept design and fabrication process. The whole project involved various method and process that usually use in engineering such as concept design, analysis process and lastly fabrication process.

This final year project takes one semester to complete. This project is individual project and must be done within this semester. In this project, students must able apply all knowledge during their studies in this Diploma of Mechanical Engineering course. Overall from this project, time management and discipline is important to make sure this project goes smooth as plan and done at correct time.

ABSTRAK

Idea untuk menghasilkan dan membina rak pinggan yang bersistematik ini datang daripada penyelia yang memberi saya tajuk dan tugasan untuk projek ini. Untuk merekabentuk dan menghasilkan kabinet ini, ia hendaklah dibandingkan dengan produk lain yang mungkin berada dalam pasaran. Langkah pertama, dapatkan maklumat daripada internet, majalah, suratkhabar atau daripada sumber yang lain.

Keseluruhan projek melibatkan pelbagai cara atau kaedah seperti pengumpulan data, rekabentuk konsep dan proses membina. Kaedah yang selalu yang digunakan dalam kejuruteraan seperti proses analisis juga digunakan.

Projek akhir tahun ini mengambil satu semester untuk disiapkan. Projek ini adalah projek individu dan mesti disiapkan dalam semester ini. Didalam projek ini, pelajar mesti berupaya menggunakan segala pengetahuan yang mereka perolehi semasa pembelajaran mereka di dalam kursus Diploma Kejuruteraan Mekanikal ini. Secara keseluruhan daripada projek ini, pengurusan masa dan disiplin adalah penting dalam memastikan projek berjalan lancar dan siap tepat pada waktunya.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 Introduction

The title of this project is “design and fabricate a systematic dish rack drainer”. Fabrication of this systematic dish rack drainer is concern to strength, systematic, and more function this project is design and fabricates a systematic dish rack drainer. The fabrication of this product is concern on stops the puddle problem. It will put an end to stains and unhealthy mildew build-up. Keeps rack dry and eliminates having to mop up after washing dishes. Also, acquire the skill and knowledge of solid work, Mechanical Design, punching, and basic machining.

1.2 Objective

Diploma final years project objective is to practice the knowledge and skill of the student that have been gathered in solving problem using academic research to born an engineer that have enough knowledge and skill. This project also important to train and increase the student capability to get know, research, data gathering, analysis making and then solve a problem by research or scientific research.

The project also will educate the student in communication like in presentation and educate them to define their research in presentation. The project also will generate student that have capability to make a good research report in thesis form or technical

writing. This project also can produce and train student to capable of doing work with minimal supervisory and more independent in searching, detailing and expanding and knowledge.

Nevertheless this project also important to generate and increase interest in research work field.

1.2.1 Specific Project Objective

The objectives for this project are:

i. To study the current design dish rack drainer
ii. To design and fabricate a systematic dish rack drainer
iii. To develop a dish rack drainer able to achieve the product on customer need.

1.3 Scope

The project scope of this project:

i. To development of concept selection.
ii. To determine about product specification.
iii. Use solid work software to modeling systematic dish rack drainer.
iv. To produce or develop using process such as bending and welding

.

1.4 Problem Statement

Nowadays, there are many design dish rack drainer. Exist in the currently market. it have made from Plastic or metal. Every home use dish to put the place dish. When using it give problem to household. Example dish late to dry, puddle problem stains and unhealthy mildew build-up and not a space for certain dish.

This problem Cause household wastes many times for wash the dish. so this design create to settle this problem example use angle 90' for place the plate and fan to keep dish fast dry and improve the design become systematic with put the drain board and hose for flow the water to sink. These designs have section to put different dish. Household will comfortable when use this rack

1.5 Gantt Chart

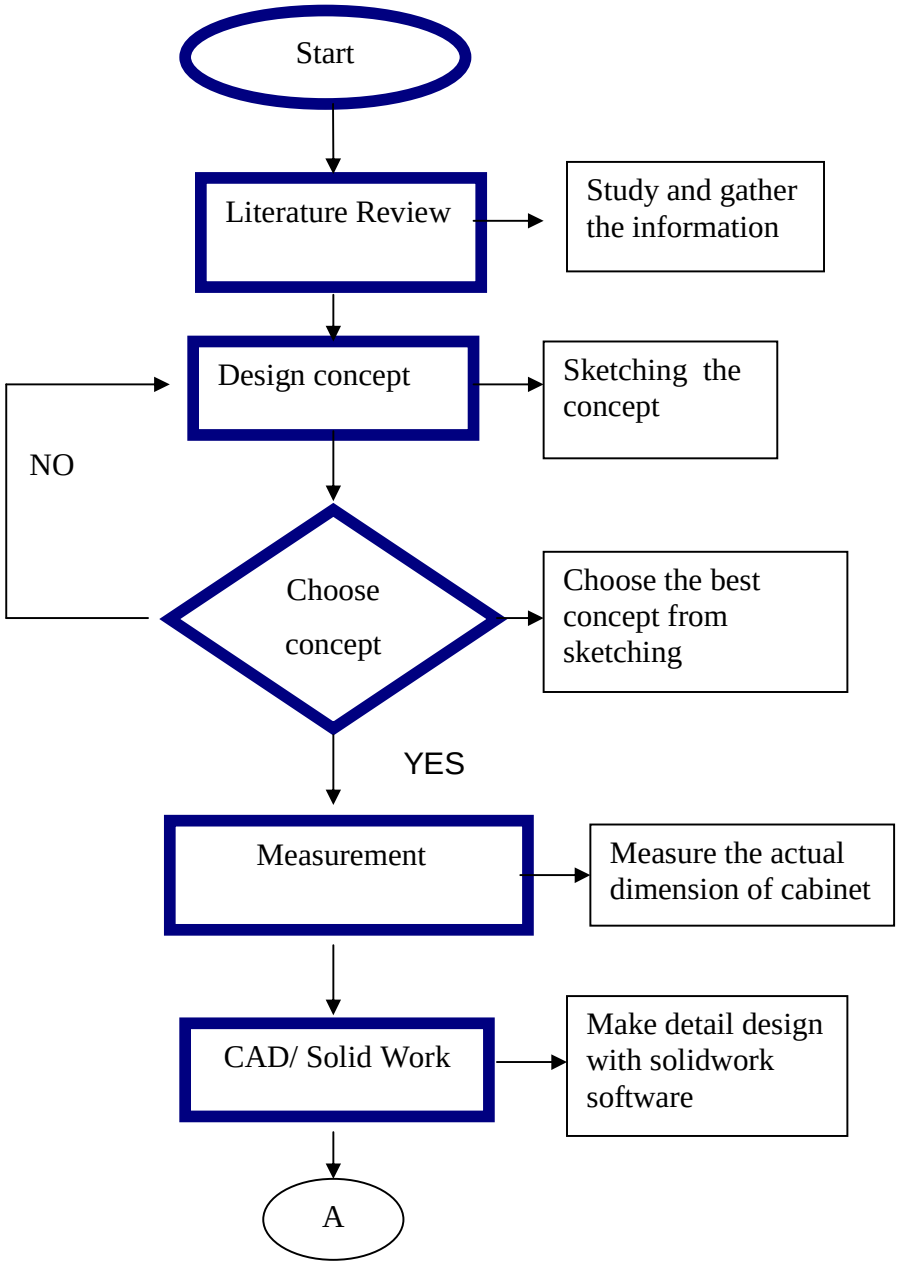
Table 1.1: Gantt Chart

ACTIVITIES / Week		1	2	3	4	5	6	7	8	9	10	11	12	13	14
briefing the final year project by lecturer	Plan														
	Actual														
hold meeting with supervisor	Plan														
	Actual														
Literature review	Plan														
	Actual														
Sketch the idea and design	Plan														
	Actual														
1st presentation	Plan														
	Actual														
Fabricate the product from the best design or idea	Plan														
	Actual														
Make the report	Plan														
	Actual														
Making the final report writing	Plan														
	Actual														
Make the slide for presentation	Plan														
	Actual														
Final year project presentation	Plan														
	Actual														

1.6 Flow Chart

In fabrication of systematic dish rack drainer, there is a planning of the overall progress to make sure the project can be finished on schedule.

Flow Chart



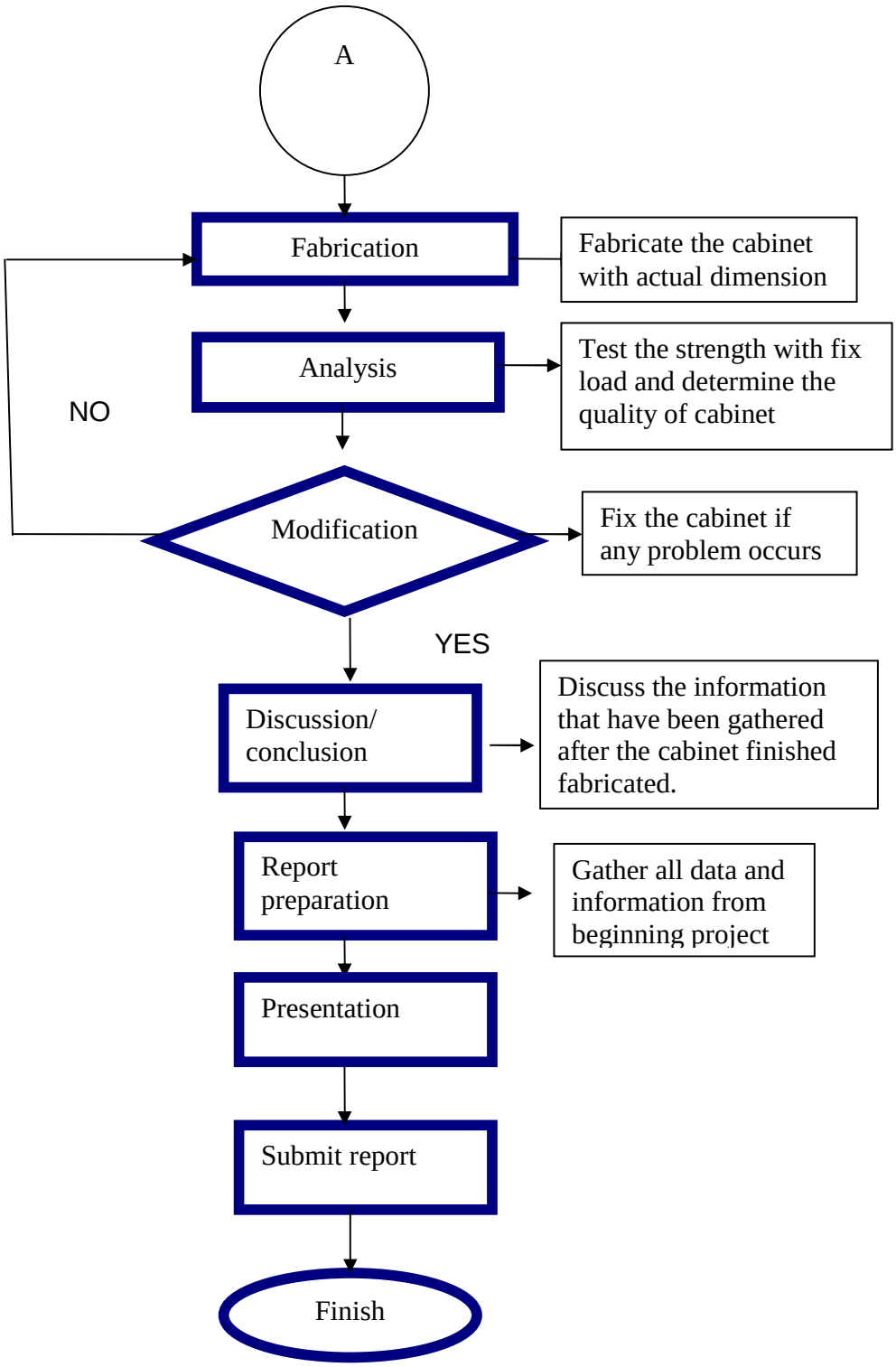


Figure 1.1: Flow Chart

From the flow chart above, this project was start with literature review and research about the title. Then, study and make a lot of investigation about dish drainer. This includes a study about concept of dish drainer, process to fabricate, and material. These tasks have been done through study on the internet, books and others.

Then the information gathered and the project is continued with the design process. It is important to make a best design for the project. After several design sketched, the best concept have been chosen through it advantages. The selected design is then transferred to detail drawing by using Solid work software.

After all the engineering drawing finished, the drawing has been used as a reference for next process, which is fabrication process. The manufacturing processes include in this process are welding, cutting, drilling, bending and others. During the fabrication process, if any wrong occur the modification step will be take the action.

Analysis stage has been implemented after fabrication stage. The evaluation is by considering the strength, durability, safety and others.

Then after all processes that mentioned above are done, all materials for report writing are gathered. The report writing will be guided by the UMP final year report writing. Preparation for final presentation also being made by finished the slide show. The project ended after the presentation and submission of the report.

1.7 Conclusion

This chapter describe about the objective that have earning when start the final year project about systematic dish rack drainer until finish this project. Scope project also list in order that know what scope need to fabricate this product example development of concept selection. before make the product about systematic dish rack drainer problem statement about the current dish rack drainer must know to easy to create new design to settle the problem. Flow chart and Gantt chart must use for become this project finish on time

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The title design and fabrication systematic dish rack drainer an amount of good understand on the knowledge of this science. Therefore executing a research is necessary to obtain all information available and related of this topic. The information or literature reviews obtained are essentially valuable assist in the construction and specification of this final year project. Research review about dish rack drainer is to gathered data to make systematic dish rack drainer.

2.2 Technical Review

2.2.1 Product 1

Figure 2.1: Product 1

Product Description

If have a small kitchen or a small sink a draining board Dish Doctor will come to the rescue!! It has an integral reservoir to collect the drips and means that it can be placed on work surfaces and in effect doubles draining board capacity! Just lift the tray out to empty the drips! Simple but special. Its spikes hold plates of all sizes firmly and 2 cutlery drainers make drying easier too. It is made from the same polypropylene as ordinary dish racks

Advantages:

i. Modern design
ii. Easy to put the dish

Disadvantages:

i. Not have tray

2.2.2 Product 2

Figure 2.2: Product 2

Product Description

Excellent compact dish drainer, ideal for your washing up or equally handy for additional storage inside your cupboards or on worktops. Contra two sturdy wire mesh shelves ideal for plates and bowls, an extended hanging shelf for cups and wine glasses and a detachable cutlery holder with three separators.

Advantages:

i. Have certain to place the dish

Disadvantages:

i. Small design

2.2.3 Product 3

Figure 2.3: Product 3

Product Description

Made of chrome plated steel, this two-level rack gives you twice as much space as other dish drainers (drainage tray not included). Use this handsome space-saving tool to dry clean dishes after washing or for permanent storage if you are running low on cabinet space.

Includes an angled storage area on top that keeps plate, platters, and baking pans upright and vertical at one time as well as a second shelf on the bottom, for bowls, cups, glasses, and other items. It also comes with a white-painted cutlery caddy dish for eating and cooking utensils.

Advantages

i. Dish fast to dry

Disadvantages

i. Have puddle problem

2.2.4 Product 4

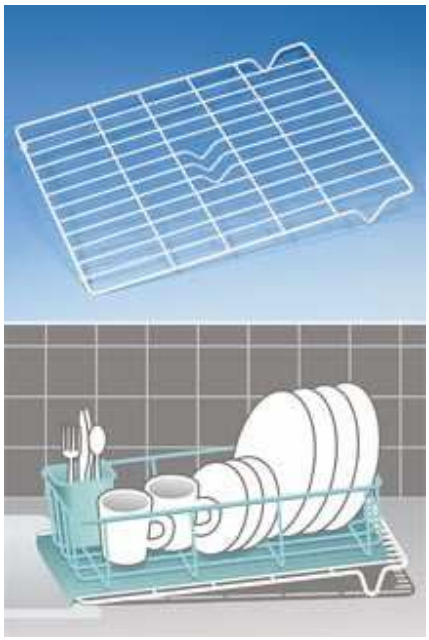


Figure 2.4: Product 4

Product Description

Dish Rack Drainer stops the puddle problem! Tilted base holds dish rack and mat at an angle to drain excess water into sink. Puts an end to stains and unhealthy mildew build-up. Keeps counter dry and eliminates having to mop up after washing dishes. Rust-resistant, vinyl-coated steel

Advantages

i. Systematic design

Disadvantages

i. Must place at the sink

2.3 Design

The Design of the systematic dish rack drainer must be compliance to several aspects. The design consideration must be done carefully so the design can be fabricated and the parts are all functioning. The aspects that must be considered in designing the systematic dish rack drainer are:

i. Strength: Must have certain strength to ensure that it can load heavy dish items.
ii. Ergonomics: dish rack must be user friendly as easy and convenience.
iii. Cost: the cost of whole system must been not exceed from budget given and also reasonable
iv. Environment: the systematic dish rack drainer is suitable to be use in all types home kitchen

2.4 Drawing

The drawing are dividing into 2 categories

i. Sketching: all the ideas for systematic dish rack drainer are sketched on the paper first to ensure that ideas selection can be made after the selected design choose

ii. Solid work: the design sketched transfer solid modeling and drawing using solid work

2.5 Sketched and Drawing Selection

From the concept selection, only 3 sketching that had been chosen to be considered as the final ideas.

2.5.1 Concept 1

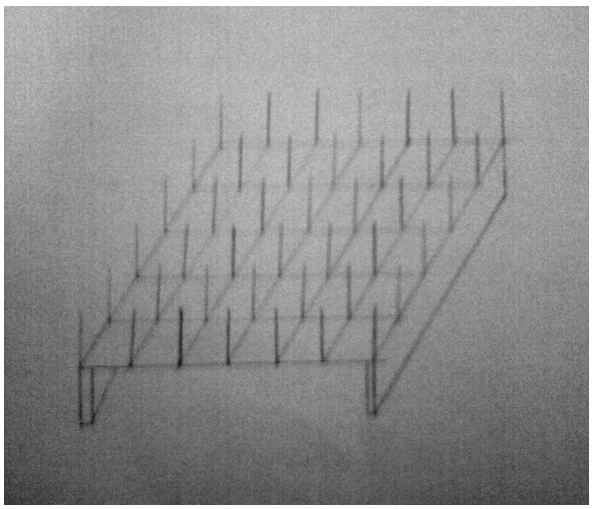


Figure 2.5: Concept 1

This concept is the datum concept to generate other concept. This concept is simple because can make any dish plate. Rod can plug and unplug follow suitable types of dish. Style to arrange the dish can be adjustable. To arrange the plate use angle 90’ for easy dish to dry. Part of this concept use sheet metal steel and steel rod. This concept is not suitable for small dish plate.

2.5.2 Concept 2

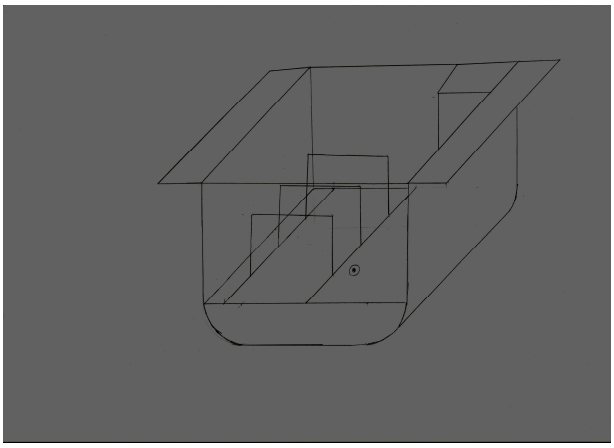


Figure 2.6: Concept 2

This concept is place on the sink. Have the section to place dish, glass, spoon and fork. Dimension of this concept design follow the area of the sink. Drain plug place at the bottom to flow water at sink. This concept use stainless steel sheet metal and hollow stainless steel. These concepts only suitable for home have two sink.

2.5.3 Concept 3

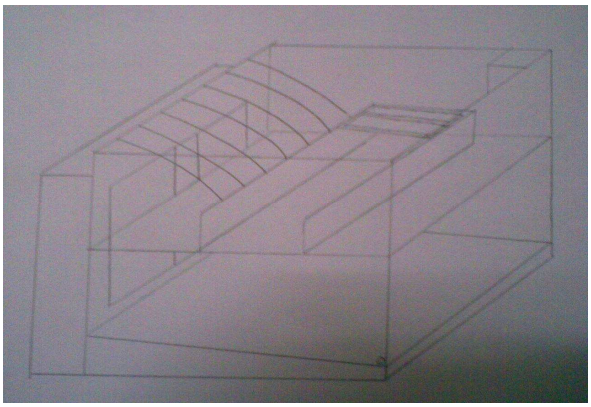


Figure 2.7: Concept 3

This concept is generated from concept 1 and 2.this concept have section to place any types of dish and use angle 90’.have 3 major part and then assemble into 1 main part. These concepts have systematic flow system. Use drain board and hose to flow water. Fan also use in order that dish fast to dry.

2.6 Metric Chart and Evaluation

Concepts for systematic dish rack drainer were developed. These are evaluated against the datum of the dish rack drainer

Table 2.1: Metric Chart

criteria	design 1	design 2	design 3	best design
simple design	******	****	***	1,2
have section	**	***	******	3
flow system	*	****	*****	2,3
portable	****	****	****	1,3
not have puddle problem	*	***	*****	3
dish fast to dry	***	***	*****	3
have drain board	*	****	******	2,3

Notes:

*** = very bad**

**** =bad**

***** = medium**

****** =good**

******* = very good**

From the metric chart table, the advantages and disadvantages of design can be outline. Criteria or characteristic for the product to be fabricated are the important thing to be consider before fabrication process.6 criteria are been chosen to be considered. According the table, study of concept selection show that concept 3 has many same with need criteria.

2.7 Solid work Design Drawing

After a design has been selected, the next step in designing process is dimensioning. The design is separated into part by part and dimensioning process is firstly sketched on paper. The dimension base on relevant dimensions and also referring the existence dish rack drainer so that design is fit into other part

After dimensioning, the drawing of the design is drawn using solid work application, at this stage solid modeling method is used. Part by part solid modeling create according to the dimension done before, after all part create, the 3D model is assemble with each other base on design

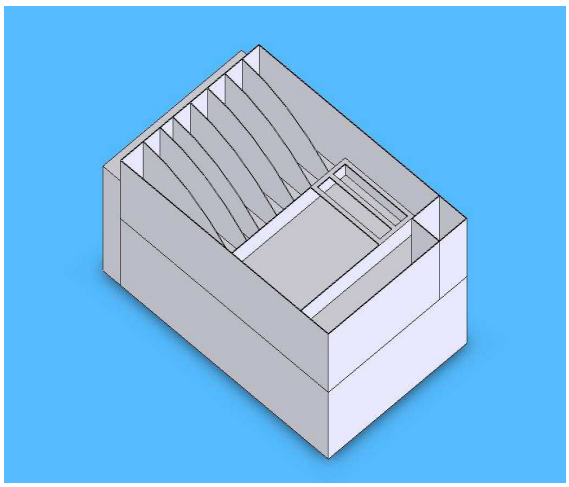


Figure 2.8: Solid work Design

2.8 Conclusion

According to literature study can see many products at the market. After the analysis of the advantages and disadvantages made, some criteria about systematic dish rack drainer necessary to create the concept.3 concept design for systematic dish rack drainer were developed. After developed the concept design metric chart and evolution done, the best concept can be choose. Then, Solid work design did to create 3D concept and fabricate the product.

CHAPTER 3

METHODOLOGY

3.1 Introductions

After designing phase, comes fabrication process. These processes is about using the material Selection and make the product base on the design and by followed the design dimension. Many methods can be used to fabricate a product, like welding, fastening, cutting, drilling and many more method. Fabrication process is difference from manufacturing process in term of production quantity. Fabrication process is a process to make only one product rather then manufacturing process that focus to large scale production. Fabrication process was used at the whole system production. This was include part by part fabrication until assembly to others component.

3.2 Research Design

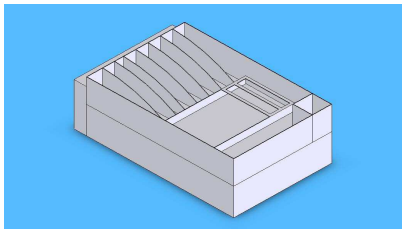


Figure3.1: Research Design

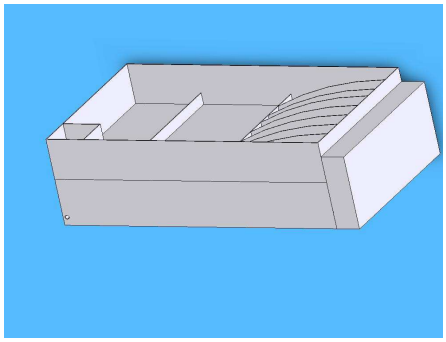


Figure3.2: Research Design

3.3 Design Specification

Based on the drawing and sketching dimension, after generate and evaluated the best concept selection refer to metric chart. The concept 3 is the best design that can be fabricated. This is detail product specification of concept 3

Table 3.1: Design Specification

No	Parts	Description /Type of materials	Dimension (cm)	Quantity
1	Drain board	Sheet metal (zinc) 1.5mm Aluminum 1mm	45 x 20 30 x 4	1
2	Below Chassis	Hollow bar (iron)	300 x 1.5	1
3	Cover below chassis	Sheet metal (aluminum) 0.3mm	200 x 200	1
4	Fan cover	Acrylic 5mm	21 x 40	1
5	Tray chassis a	Acrylic 5mm	40 x 10	2
6	Tray chassis b	Acrylic 5mm	60 x 10	2
7	Divider dish	Acrylic 5mm	25 x 10	9
8	Spoon chassis	Acrylic 5mm	8 x 8	2
9	Saucer chassis	Acrylic 5mm	20 x 10	1
10	Divider section	Acrylic 5mm	40 x 3	3
11	Net	Plastic	60 x 40	1
12	Hose	Plastic	50	1

3.4 Fabrication Process

After designing phase, fabrication processes take place. These processes are about using material selection and make the product base on the design and by followed the design dimension. Many methods can be used to fabricate the a product, like shearing,drilling,punching and many more methods. Fabrication process is a process to make only one product rather then manufacturing process was used at the whole system production. This ways include part by part fabrication until assembly to other component

3.5 Process Involve

In order to make the design come to reality, fabrication process needs to be done first. The fabrication process starts from dimensioning the raw material until it is finish as a desired product. The processes that involved are:

i. Measuring: Materials are measured to desired dimensions or location.
ii. Marking: All measured materials need to be marked to give precise dimension.
iii. Shearing: Marked materials are then cut into pieces.
iv. Bending: sheet metal undergoes process bending to get true shape for the project
v. Joining: Materials joined by the method of MIG welding and rivet.
vi. Drilling: Marked holes are then drilled to make holes for rivet.
vii. Laser cutting :cut the prospect
viii. Assembly: assemble part to another part

3.6 Part by Part Fabricate

3.6.1 Tray Chassis

Figure 3.3: Tray Chassis

i. Design part by part with solid work design

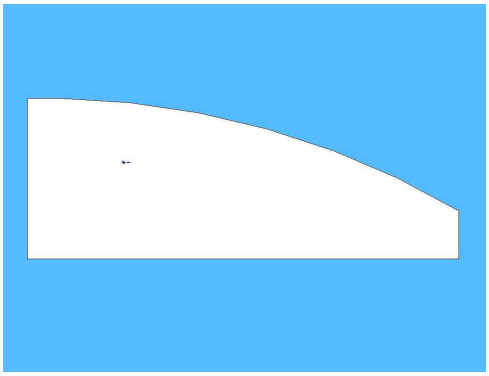


Figure 3.4: Example Design Part by Solid work

ii. Convert design to art cam software

iii. Use program pcnc.h to convert G code to machine

iv. Set the delay 2800

v. Move machine use program jogging edit

vi. Cut the acrylic use laser cutting machine

Figure 3.5: laser Cutting Machine

vii. Overall Time take to cut the acrylic is 15 minutes

viii. Use silicon gum to joint part by part

Figure 3.6: Joint Process use Silicon Gum